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A HOUSEHOLD CLUSTER OF FULMINANT GROUP A STREPTOCOCCUS PNEUMONIA ASSOCIATED WITH TOXIC SHOCK SYNDROME—QUEBEC

In the last few years, serious cases of group A streptococcus (GAS) invasive infections have been increasing worldwide[1,2,3]. Many questions related to this entity remain unanswered, especially those of secondary cases in close contact with an index patient. Household clusters have been described but are not numerous, and no study has yet clearly established the risk of acquiring the infection in this particular population[4]. It is well known that GAS has the ability to spread from infected patients to close contacts, but this usually involves patients with pharyngitis and sometimes impetigo[5].

In this report, we describe a household cluster of a necrotizing pneumonia associated with a streptococcal toxic shock syndrome in two members of a family. This is, to our knowledge, the first report in the medical literature of such an occurrence.

Because of the exceptional circumstances of these cases, we also conducted a small epidemiologic investigation to establish the prevalence of the GAS carrier rate in the contacts. The obtained data may have an impact in understanding bacteria transmission within a household.

Case 1

On 20 February, 1995, a 35-year-old woman with no previous medical history, no known allergy, and no recent travel was brought in shock to the emergency room (ER) of a Montreal hospital. Three days prior to her admission she had sustained a minor snowmobile accident in which she experienced small cuts and bruises. The following day she developed fever, chills, and a productive cough. The patient also noted a left-sided pleuritic pain, which radiated to the left shoulder. Twenty-four hours before her admission she complained of dyspnea and nausea, and she vomited twice. The patient was known to have a drinking problem for 4 years and, according to her mother, had ingested many acetaminophen pills in the 48 hours preceding her hospitalization. In the previous week, she became sick, her husband complained of a sore throat for which he did not seek medical attention, and one of her children was under treatment (cefaclor) for acute otitis media.

On presentation, the patient was comatose with peripheral cyanosis. She was afebrile, blood pressure was 80/50 mm Hg, respiratory rate was 35/minute, and pulse was 120 bpm. The physical examination was normal except for the presence of bronchial breathing and rhonchi in the left lower lung area, an enlarged liver, and two ecchymosis, one below the right eye and the other on the left arm. The initial chest x-rays revealed an alveolar left lower lobe infiltrate. A toxicologic screen showed a high blood level of acetaminophen (1,084 µmol). She received N-acetyl- cysteine for her acetaminophen intoxication as well as intravenous antibiotics (clindamycin and ceftriaxone) for her left lower lobe pneumonia. In spite of aggressive treatment, her condition continued to deteriorate. The patient was transferred to the intensive care unit (ICU) and had to be intubated. The following day she developed acute renal failure and adult respiratory distress syndrome. An ultrasound showed an important pleural effusion: a pleural tap drained 1,700 cc of a purulent fluid. In the meantime, GAS was isolated from the patient's sputum samples as well as from the empyema; all blood cultures remained negative. Twenty-four hours after her admission, intravenous human immunoglobulins were added to the therapy to control the inflammatory process. The patient's status worsened. She died on the third day of her admission. The autopsy report mentioned a bilateral necrotizing pneumonia accompanied by a concomitant extensive liver and kidney necrosis.

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Case 2

On 1 March, 1995, the mother of the above patient came to the ER of a second Montreal hospital with a history of cough, dyspnea, and hemoptysis present for 2 days. This 60-year-old woman had a history of smoking but was in good health. She was living below her daughter's apartment and was in frequent and prolonged contact with all the family members.

When examined for the first time in the ER, the patient was alert and hemodynamically stable, and her temperature was 38.5° C. The physical examination at admission was normal except for a right bronchial breathing on chest auscultation. The first chest x-rays showed a right upper lobe alveolar infiltrate, and the ER physician started antibiotic therapy with intravenous cefuroxime. Four hours later, the patient rapidly deteriorated and went into severe shock. The patient was transferred to the ICU and had to be mechanically ventilated. Antibiotic therapy was switched to ceftriaxone and erythromycin. A Gram's stain performed on a sputum sample showed gram-positive cocci in pairs. Clindamycin was added to the antibiotic regimen. The patient's condition worsened, she developed a rapidly progressing acute renal failure, thrombocytopenia, and a profound leukopenia (WBC 1.8×10^6/L). The patient went into an irreversible coma and died 15 hours after having been admitted to the hospital. Intravenous immunoglobulins were withheld, as the family decided it would be better to stop all aggressive treatment. As in the first case, the autopsy revealed a massive necrotizing pneumonia. GAS was isolated in pure culture from several sputum samples and from a pulmonary biopsy taken during the course of the autopsy. Three blood cultures taken at admission remained negative after 7 days.

Epidemiologic Survey and Discussion

As this seemed to be a case of GAS transmission within the same household, we investigated all close contacts. When the first patient died, all the relatives (16) and the immediate family (4) gathered at a mortuary, where they spent a full day in contact with the mother, who was probably already harbouring the bacteria and was starting to cough. These people also spent the following day together. This situation probably exposed all these persons to the GAS.

A few hours after the mother's death, all the individuals were seen in our department and a throat swab was taken from each one. A second throat culture was done 2 weeks later to increase the detection rate of GAS. One of 20 members of the family was carrying the bacteria in his throat, but he was healthy and was not complaining of any upper respiratory symptoms. To further characterize the different strains (1 contact, 3 belonging to the sick patients) and prove the molecular relationship between all of them, they were sent to the Canadian National Centre for Streptococcus in Edmonton, Alberta. M and T serotyping were, respectively, done by the Lancefield immunodiffusion technique and the Griffiths agglutination method. Exotoxin detection (SPE-A, B, and C) was based on a polymerase chain reaction analysis of the genetic sequences coding for these components. All four strains were serotyped as M1T1 and were carrying both the SPE-A and the SPE-B toxins. The healthy carrier was one of the first child patients. He was given a 10-day course of antibiotic prophylaxis consisting of cefixime, and the subsequent control culture was negative.

Although the total number of tested patients in this report is relatively small, the fact that a member of the same household was carrying a potentially invasive form of GAS probably warrants the institution of an antibiotic prophylaxis for this category of contacts to decrease the likelihood of having a secondary case.

What is also interesting is that no relative was found to harbour the bacteria in spite of the contact they had. This probably demonstrates that a prolonged and sustained contact with an index case is necessary for acquiring the bacteria. The proportion of individuals colonized by the microorganism is directly proportional to the number of hours spent with the ill index case. Person-to- person spread of GAS occurs through respiratory droplets and direct contact with body secretions. Moreover, it is known that, compared to the general population, families with children have a higher rate of GAS throat carrier. It seems that children are probably the ones introducing the bacteria within families[6], but for reasons still to be elucidated, they do not become sick as often as adults.

This dramatic incident illustrates the relative contagiousness of invasive GAS strains. Large epidemiologic studies are needed to better characterize the transmission rate.

Acknowledgement

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STRATEGIES FOR PREVENTING EARLY ONSET GROUP B STREPTOCOCCAL INFECTION

Canadian Physicians' Preferences and Ratings of Effectiveness and Feasibility

Despite improvements in the management of newborns affected by early onset group B streptococcal sepsis (GBS) during the past decade, this disease continues to be a major cause of mortality and morbidity[1]. In the short term, chemoprophylaxis appears to be the most effective available strategy for prevention of GBS[2,3]. However, the preferred chemoprophylaxis approach has been the subject of controversy for several years. Strategies for preventing GBS by chemoprophylaxis have been proposed by consensus groups in the United States[4,5,6] and Canada[7]. The tendency for clinicians to comply with these strategies is likely to be influenced by their perceptions of the effectiveness and feasibility of the strategies in their respective settings.

This study was conducted to determine physicians' preference rankings as well as effectiveness and feasibility ratings of various strategies for preventing early onset GBS. The strategies included those recommended jointly by the Canadian Paediatric Society and the Society of Obstetricians and Gynaecologists of Canada[7], i.e., either of the following:

1) *universal screening of all pregnant women at 26 to 28 weeks gestation with a single combined vaginal–anorectal swab, and selective intrapartum chemoprophylaxis of women with identifiable risk factors who are colonized with group B streptococci*
2) *no universal screening, but intrapartum chemoprophylaxis for all women with identifiable risk factors (this strategy should also be used in cases where universal screening is the policy but was either not done or the test results are not available).*

In the context of the recommendations, the recognized risk factors for which intrapartum chemoprophylaxis is recommended are as follows:

1) *pre-term labour (< 37 weeks gestation)*
2) *term labour (≥ 37 weeks gestation)*
   a) prolonged rupture of membranes (> 18 hours before delivery)
   b) maternal fever (> 38° C orally)
3) *previous delivery of a newborn with GBS regardless of current group B streptococcal colonization status*
4) *previously documented group B streptococcal bacteriuria*

Methods

We identified Canadian clinicians most likely to be involved in the management of GBS as belonging to three main groups of subspecialists: neonatologists, infectious diseases/microbiology (ID/Micro) specialists, and physicians practising obstetrics (OB). Following pretesting in Ottawa, a questionnaire was sent to all in the first two groups identified in 1994 as members of the Canadian Paediatric Society (CPS) and the Canadian Infectious Diseases Society (CIDS). Due to the large number of individuals identified in the third group who were specialists in obstetrics and family medicine, we chose to target the obstetric specialists identified through the Canadian Medical Directory database[8]. We sent a questionnaire to every sixth obstetrician listed. Questionnaires were mailed between 1 December, 1994, and 31 January, 1995. We employed a single mail-out strategy and accepted responses up to 31 March, 1995, to minimize the effects of changes in attitudes over time in response to policy changes in the United States.

Results

A total of 696 questionnaires were mailed to physicians across Canada: 296 ID/Micro specialists, 150 neonatologists, and 250 OBs. The number of returns was 257, for an overall response rate of 37%. Of these 257, 15 physicians were not involved in the management of GBS, 18 questionnaires were either undelivered or returned with insufficient information, 3 were returned too late for analysis, and 1 respondent was a non-clinician member of CIDS. Therefore, data from 220 respondents formed the basis of the analyses. In cases where physicians changed their type of practice (such as moving to general practice), the results were analyzed according to their initial subspecialty group.

The median year of graduation from medical school was 1976. Among 207 physicians who indicated their primary practice locations, 69.6% (144/207) practised in an urban area, while 25.1% (52/207), 4.3% (9/207), and 1% (2/207) indicated their practice locations to be suburban, rural or a combination of the above, respectively. Provincially, the breakdown was as follows: Ontario 36.4% (80/220), Quebec 25.9% (57/220), British Columbia 11.4% (25/220), Alberta 9.1% (20/220), Nova Scotia 6.8% (15/220), Manitoba 4.6% (10/220), Saskatchewan 1.8% (4/220), New Brunswick 2.3% (5/220), Newfoundland 0.46% (1/220), Prince Edward Island 0.46% (1/220), and 0.91% (2/220) indeterminate.

Sixty-three per cent (139/220) of respondents indicated that antenatal group B streptococcal screening of pregnant women occurred in their centres, while 30.5% (67/220) indicated that no screening occurred in their centres; data on screening were not provided by the remaining 14 respondents (6.4%). Seventy-seven per cent (107/139) of the 139 respondents indicated that antenatal screening for group B streptococci occurred in the early third trimester, while 27% (37/139) and 29% (40/139) indicated that screening occurred in the late third trimester and intrapartum, respectively. In some centres, respondents indicated that the policy was to screen at more than one of the above periods. Seventy-two per cent (158/220) of respondents indicated that in their centres intrapartum penicillin was the standard of care for prevention of GBS; this included 44 of the 67 (66%) who indicated no screening. The majority of respondents indicated that when penicillin was administered, the target group was high-risk* colonized women (113/158) and high-risk women irrespective of colonization status (113/158).

* High-risk was defined as age < 20 years, previous GBS, premature labour (< 37 weeks), prolonged rupture of membranes (> 18 hours prior to delivery), multiple pregnancy, GBS bacteriuria and fever during labour (> 38° C).

The Canadian consensus options each had a median preference ranking of 3 (on a scale of 10) overall (Table 1). Respondents gave the "other" option category a relatively high ranking, i.e., they believed that some option other than the ones listed was preferred. One of these "other" options was vaccination if a vaccine became available in the future.

Discussion

The majority of OBs, ID/Micro specialists, and neonatologists who responded to our survey screen for group B streptococci in the early third trimester, while a significant proportion (27%) screen in the late third trimester. However, almost one-third (30.7%) of respondents indicated that antenatal screening was not routinely done in their centres. Intrapartum penicillin was most often offered to high-risk colonized pregnant women. However, two-thirds of physicians who indicated no screening for group B streptococci indicated that intrapartum penicillin was offered to pregnant women based on risk factors.

The use of intrapartum penicillin as the standard of care was indicated by only 72% of respondents; 18% provided no information on this item, while 10% stated that such was not the case in their centres. Thus, the acceptance of intrapartum penicillin in preventing GBS was non-uniform.

Table 1
Preference ranking, effectiveness and feasibility scores for prophylaxis options for the overall group of physician respondents

A – Median preference rank *(highest = 1, lowest = 10)*

B – Median effectiveness rating *(good = 3, fair = 2, poor = 1)*
C – Median feasibility rating *(good = 3, fair = 2, poor = 1)*

Options	A	B	C
Early third trimester screening using culture; intrapartum penicillin for high-risk colonized women	3	2	2
No screening; intrapartum penicillin for high-risk women	3	2.5	3
Late third trimester screening using culture; intrapartum penicillin for high-risk colonized women	4	2	2
Early third trimester screening using culture; intrapartum penicillin for all colonized women	5	2	2
Late third trimester screening using culture; intrapartum penicillin for all colonized women	5	2	2
Intrapartum screening using a rapid antigen test; intrapartum penicillin for high-risk colonized women	5	2	2
Intrapartum screening using a rapid antigen test; intrapartum penicillin for all colonized women	6	2	2
No screening; intrapartum penicillin for all pregnant women	9	2	1
No screening; no prophylaxis	10	—	—
Other options	3	3	3

ID/Micro specialists preferred the consensus option involving early third trimester screening, while the OB specialists preferred the option that does not involve screening in the early third trimester, but with intrapartum prophylaxis for high-risk colonized women (Table 2). When the results were analyzed for the overall group of physicians, these two options were equally ranked; the next most highly ranked option involved screening in the late third trimester with intrapartum prophylaxis for high-risk colonized women. This latter option was regarded by the group as being of equal effectiveness and feasibility to the option involving screening in the early third trimester. The lowest ranking options included those that involved intrapartum screening using rapid antigen tests. This is in keeping with the fact that currently available rapid antigen tests have inadequate sensitivity for detecting group B streptococci[9].

None of the options obtained a "good" effectiveness median score; however, the top three preferred options were regarded as having "fair" effectiveness. The option that scored the highest on the feasibility rating was the Canadian consensus option that involved no screening but intrapartum prophylaxis for high-risk women. This option, as perceived by the respondents, represented the best combination of preference, presumed effectiveness, and feasibility. However, this particular option has not been the subject of a randomized controlled trial, unlike the consensus option involving screening in the early third trimester[2].

Table 2
Canadian consensus options for the prevention of early onset GBS: Preference rankings by physician groups

	Option A			Option B		
Physician group	25th %tile	Median	75th %tile	25th %tile	Median	75th %tile
ID/Micro specialists	1	2	5	2	3	5
OB specialists	2	5	7	1	2.5	7
Neonatologists	1	2	5	1	3	6

Option A: Screen at 26–28 weeks using vaginal-anorectal culture; intrapartum prophylaxis for high-risk colonized women
Option B: No screening; intrapartum prophylaxis of high-risk women

Groups other than those studied are involved in the management of GBS in Canada. These groups include family medicine and nurse practitioners who practice obstetrics. For practical reasons, the present study was not intended to be all-inclusive but was designed to reflect input from the groups most involved in the development of the Canadian consensus statement.

Despite a response rate of 37%, we believe that the responses reflect core practice across Canada and that it would be unlikely for those who did not respond to be more involved in the management of GBS than the respondents, given the extremely high level of interest in GBS prevention across Canada at the time of the survey. There is evidence to indicate that the responses were obtained from the trendsetters as far as GBS prophylaxis in Canada is concerned. Responses were obtained from physicians representing the major tertiary institutions in Canada. These physicians included current and past training program directors or division heads.

We were impressed by the disparity in preferences, indicating the need for further examination, ongoing information sharing, and

continued consensus building across the subspecialty groups, including those not targeted in this study.

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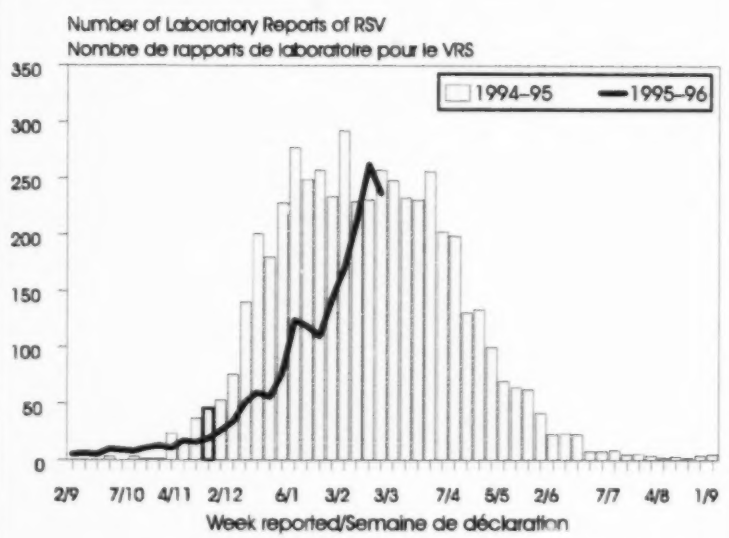
RESPIRATORY SYNCYTIAL VIRUS IN CANADA

To date this season, LCDC has received 1,809 reports of laboratory identifications of respiratory syncytial virus (RSV); this compares with 3,284 reports for the same period last season (1994/1995). The reporting trend this winter contrasts quite markedly with that seen last season when reporting increased in early December and peaked by early to mid January (Figure 1).

Source: *Laboratories contributing to the Respiratory Virus Surveillance Program, Disease Surveillance Division, Bureau of Infectious Diseases, LCDC, Ottawa, and WHO.*

Figure 1
RSV in Canada, 1994–95 and 1995–96



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